$$\therefore \frac{r+(z-r)\sec\theta}{u}=\frac{yz}{m}. \qquad \therefore y=\frac{m}{uz}(r-r\sec\theta+z\sec\theta)=y'.$$

The limits of θ are 0 and 2π; of z, 0 and $2r$ for total, and $r(1+\cos\theta)=z'$ to $r(1-\cos\theta)=z''$ for favorable cases; of y, 0 and $2\surd(2rz-z^2)=y''$ for total, and 0 and y' for favorable cases.

$$\therefore p=\frac{\int_0^{2\pi}\int_{z''}^{z'}\int_0^{y'}d\theta\, dz\, dy}{\int_0^{2\pi}\int_0^{2r}\int_0^{y''}d\theta\, dz\, dy}=\frac{1}{2\pi^2r^2}\int_0^{2\pi}\int_{z''}^{z'}\int_0^{y'}d\theta\, dz\, dy$$

$$=\frac{m}{2\pi^2r^2u}\int_0^{2\pi}\int_{z''}^{z'}\frac{(r-r\sec\theta+z\sec\theta)d\theta\, dz}{z}$$

$$=\frac{m}{\pi^2ru}\int_0^{2\pi}(1+\sec\theta\log\tan\tfrac{1}{2}\theta-\log\tan\tfrac{1}{2}\theta)d\theta=\frac{2m}{\pi ru}.$$

Therefore the chance of meeting one derelict out of the n is $\Sigma p=2nm/\pi ru$, and the probability that e will be encountered is

$$\Pi\left(\frac{2nm}{\pi ru}\right)=\left(\frac{2nm}{\pi ru}\right)^e.$$

CALCULUS.

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203. Proposed by S. A. COREY, Hiteman, Iowa.

Evaluate* $\int_0^\pi \frac{\sin mx\, dx}{x}$.

Solution by G. B. M. ZERR, A. M., Ph. D., Parsons, W. Va.

$$\int_0^\pi \frac{\sin mx}{x}dx=\int_0^\pi\left(m-\frac{m^3x^2}{3!}+\frac{m^5x^4}{5!}-\frac{m^7x^6}{7!}+\dots\dots\right)dx$$

$$=m\pi\left(1-\frac{m^2\pi^2}{3.3!}+\frac{m^4\pi^4}{5.5!}-\frac{m^6\pi^6}{7.7!}+\dots\dots\right).$$

Also solved by L. E. Newcomb.

204. Proposed by M. E. GRABER, A. M., Heidelberg University, Tiffin, Ohio.

Required the variation of $\int V dx$ where V is a function of x, y, $\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$ ..... and v where $v=\int V' dx$ and V' is also a function of x, y, $\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$.....

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*See Byerly's *Integral Calculus* (p. 23, Table of Integrals) Formulae 211 and 241. A solution not in the form of an infinite series would also be desirable.